PREVENTION

Individual characteristics are less important than event characteristics in predicting protected and unprotected anal intercourse among homosexual and bisexual men in Melbourne, Australia

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Accepted for publication
2 May 2006
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Objective: To describe individual, social network and encounter specific factors associated with protected anal intercourse (PAI) and unprotected anal intercourse (UAI).
Methods: This was a cross sectional survey conducted between April and November 2002. A total of 733 sexual encounters were reported by 202 men recruited from the gay community in Melbourne, Australia. Predictors of self reported PAI and UAI were examined.
Results: Of the 733 sexual events most (56.3%) did not involve anal intercourse, and more involved PAI than UAI (30.6% versus 13.1%). PAI was more likely than no anal intercourse (NAI) if the participant's social network was mostly homosexual, the partner was an occasional or casual partner, or was HIV positive. PAI was less likely if sex took place at a ''beat'' but more likely if it took place at a sauna. PAI was more likely if the partner was affected by drugs or alcohol. UAI was more likely than NAI if the participant had injected drugs in the year before interview. It was less likely if the partner was occasional or casual or was HIV positive but more likely if the partner's HIV status was unknown. UAI was much more likely than NAI if the encounter took place at a ''sex on premises'' venue.
Conclusions: In this analysis it is the characteristics of the sexual encounter that predict whether PAI or UAI rather than NAI takes place.

The factors associated with anal intercourse, particularly unprotected anal intercourse (UAI), are numerous. Often, research focuses on particular potentially explanatory factors such as whether the partner had been met via the internet[1] or whether either or both partners were under the influence of drugs or alcohol.[2–5] Recently, we increased the range of factors of interest by demonstrating that the structure and composition of men's social networks were associated with the number of sexual partners men reported having.[6] An emerging focus of research on UAI is the sexual encounter in which the intercourse took place, which demonstrates that, at least in relation to the most recent sexual encounter, characteristics of the men are important predictors of behaviour.[3 7]

The aim of the present paper is twofold. Firstly, we wish to increase further our understanding of the complexity surrounding men's practice of both protected anal intercourse (PAI) and UAI by simultaneously considering the characteristics of the men, their social networks, and a number of their sexual encounters. Secondly, by considering those characteristics simultaneously we aim to eliminate the factors that are not significant independent influences on UAI and PAI. Furthermore, by examining a number of sexual events reported by the same group of men, we are able to consider the relative contributions of personal characteristics, social network characteristics, and the specific characteristics of a particular sexual encounter.

METHODS
Sample and recruitment
The Victorian Networks Study (Vines) is an exploration of the social and sexual networks of homosexual men in Melbourne, Australia.[6 8] Our initial approach was to invite the participation of five homosexual men known to the researchers and who were actively involved in gay community organisations. At the end of the interview (see below) we asked the men to invite all people they had named as members of their social networks to participate in the study and to contact the research team as a first step in that participation. This generated few additional participants and we chose to undertake supplementary recruitment through newspaper advertisements in Melbourne Community Voice (a local gay community newspaper) and Joy Melbourne, a gay and lesbian community radio station. The advert invited homosexual men to take part in a study of social networks. Participants contacted the researchers by telephone and interviews were arranged. As with the initial five participants, those who responded to the advert were asked at the end of the interview to invite all people they had named as members of their social networks to participate in the study.

In order to participate in the study, individuals had to be at least 16 years of age and have sufficient proficiency in English to complete the interview. The primary focus of the study was the social and sexual networks of homosexually active men in Melbourne although being homosexually active was not an explicit criterion for eligibility to participate. Given the recruitment method used in the study, a small number of women were also recruited into the study as members of men's social networks. In order to maintain the focus on the population of homosexually active men in Melbourne, only those members of women's social and sexual networks who were homosexually active men were eligible to be recruited.

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Abbreviations: NAI, no anal intercourse; PAI, protected anal intercourse; SOPV, sex on premises venue; UAI, unprotected anal intercourse; Vines, Victorian Networks Study

Interviews

Vines used an interviewer administered survey instrument. The interview obtained detailed demographic information, a sexual life history, and information on social networks. Participants were assured that the information they provided was confidential and would not be disclosed to other participants in the study.

Participant characteristics

Demographic information about the participants included their age, sexuality identity (homosexual, bisexual, queer/other), current employment status (full time, part-time, none), country of birth (coded as Australia or other), income (<$A20 001 (£8026, €11 714), $A20 001–$A52 000, >$A52 000) and years of formal education completed (coded as completed high school or less versus having post-high school education). Also asked was the participant's history of injecting drug use (never, not in the last year, in the last year), and HIV status (negative, positive, not determined).

Social network enumeration

Participants were invited to name up to 20 people to whom they were closest—that is, people that the participant saw or talked to regularly and shared his personal thoughts and feelings with. They were also invited to nominate up to an additional 20 people that they sought out and spent time with on a regular basis but who were not very close to the respondent. The participant indicated which of the people named knew each other. The maximum of 40 was determined as appropriate through piloting.

For people in each category, participants reported the mix of men and women (men only; more men than women; equal men and women; more women than men; women only), the mix of straight and gay (only gay close friends; more gay friends, but some straight; equal gay and straight; more straight friends, but some gay; only straight close friends) and the mix of HIV positive and HIV negative (positive friends only; more positive than negative; equal positive and negative; more negative than positive; negative friends only). The age of all of the friends relative to the respondent (generally younger than me; about the same age as me; generally older than me) was also ascertained. For the purposes of the present paper, the two components were combined and summarised. Thus, the networks were coded as being mostly homosexual if the respondent had indicated that the majority of people in both network components were homosexual. Summary measures for the gender mix and HIV mix were similarly derived.

Characteristics of sexual encounters

Men were invited to provide information about the most recent sexual encounter with up to their five most recent partners in the year before interview. Some of the sexual partners named had already been enumerated as social contacts. Information included their relationship to the partner (regular partner, occasional partner, casual partner), their assessment of their partner's HIV status (not assessed/

not sure, positive, negative). Details of the event collected included whether anal intercourse had taken place, who was the receptive or insertive partner (or both), and whether condoms were used.

They were asked where the sex had taken place (the participant's home, the partner's home, a beat (public place such as a park, beach, or public toilet), a sauna, a ''sex on premises'' venue (SOPV), or some other site. Participants were also asked whether they (no, yes) or their sexual partner were under the influence of alcohol or drugs (no, yes).

Analysis

UciNet was used to estimate two sociometric parameters about the participant: the size their social networks and the density of the networks.[9] Egocentric network size is simply the number of people the participant named and egocentric network density is the proportion of those people who knew each other.[10]

Multilevel multinomial logistic regression was used to model the data in MLwiN.[11] The outcome was no anal intercourse (NAI) versus PAI and NAI versus UAI. Most homosexual encounters in Australia do not involve anal intercourse.[12] Thus, in order to understand the personal, social and contextual influences on UAI, we must properly understand the personal, social, and contextual influences on all anal sex, or indeed whether anal sex occurs at all. Given that the data were multiple events reported by the same group of men, they cannot be assumed to be independent and hence uncorrelated.

An intercept only model was fitted to establish the existence of significant variance between men in the practice of NAI versus PAI and NAI versus UAI. The model was estimated with first order marginal quasi-likelihood and refined second order penalised quasi-likelihood. In the interests of model stability, the covariance between PAI and UAI was constrained to zero.

Each potential predictor was evaluated separately and those with a p value <0.10 for predicting PAI and/or UAI identified. All those variables were then included in the model and assessed jointly. Variables that were no longer significant were removed from the modelling sequentially and the model re-estimated. Because it was a multinomial model, there were two arms: one was predicting PAI from NAI; and, one predicting UAI from NAI. Variables could be retained in the model where they are significant predictors in only one arm and they were included only in that arm.

RESULTS

A total of 213 people were recruited into the study and this paper deals with the 202 men who provided complete data on at least one sexual event in the year before interview. Most were Australian born (79.21%), college or university educated (60.40%), and identified as homosexual (90.59%). Their mean age was 36.9 years (range 19–71). Most were in full time (46.53%) or part-time (23.27%) employment. Most were HIV negative (73.27%) with fewer being HIV positive

Table 1 Results of the intercept only random intercept model. No anal sex is the reference category and is omitted

Parameter	Protected anal intercourse	Unprotected anal intercourse
Intercept (odds ratio)	0.47	0.16
Intercept 95% confidence interval	0.35 to 0.61	0.11 to 0.23
Variance	1.95	3.14
Variance 95% confidence interval	1.22 to 2.67	1.73 to 4.55

Table 2 Results of the multivariate random intercept model. No anal sex is the reference category and is omitted

	Protected anal intercourse	Unprotected anal intercourse
	Adjusted odds ratio (95% CI)*	Adjusted odds ratio (95% CI)
Participant characteristic		
Injecting drug use history		
Never		1.00
Not in last year		0.86 (0.22 to 3.33)
In last year		9.97 (3.33 to 29.89)
Social network characteristic		
Sexuality mix		
Majority not gay	1.00	
Majority gay	2.48 (1.38 to 4.47))	
Sexual encounter characteristics		
Relationship to partner		
Regular	1.00	1.00
Occasional	3.29 (1.56 to 6.92)	0.41 (0.19 to 0.88)
Casual/other	2.64 (1.20 to 5.78)	0.11 (0.04 to 0.31)
Partners' HIV status		
Negative	1.00	1.00
Positive	0.47 (0.28 to 0.80)	0.18 (0.08 to 0.38)
Undetermined/not sure	1.75 (0.71 to 4.31)	3.00 (1.08 to 8.32)
Where sex took place		
Participant's home	1.00	1.00
Partner's home	1.55 (0.91 to 2.64)	1.99 (0.96 to 4.12)
Beat	0.06 (0.01 to 0.23)	0.85 (0.18 to 4.01)
Sauna	2.14 (1.03 to 4.42)	1.91 (0.59 to 6.21)
Sex on premises venue	2.22 (0.87 to 5.70)	17.99 (4.74 to 68.22)
Other	0.47 (0.20 to 1.10)	1.95 (0.69 to 5.52)
Partner affected by drugs/alcohol		
No	1.00	
Yes	1.55 (1.01 to 2.39)	

*Confidence interval.

(15.84%) or of unknown status (10.82%). Most did not have a history of injecting drug use (83.17%) and of those who did, more reported no injecting drug use in the last year (8.91%) than before a year before interview (7.92%).

Nearly half the men's networks contained a majority of men (41.09%) and fewer were mostly homosexual rather than straight (37.13%) or entirely HIV negative (37.13%). Most were generally the same age (60.40%) rather than younger (15.84%) or older (23.76%) than the participant. Network size had a mean of 18.5 (range 3–40) and network density a mean of 0.38 (range 0.06–0.90). For analysis, network density was rescaled to 0–100.

The men reported a total of 733 sexual events, an average of just under four events per man. Just over half (56.3%) did not involve anal intercourse, and of those that did more than twice as many involved PAI than UAI (30.6% versus 13.1%). The encounters were more commonly with casual partners (57.6%) or occasional partners (27.3%) than regular partners (15.1%). The HIV status of the partner was generally not determined (60.8%) but was more commonly HIV negative than HIV positive (32.5% versus 6.7%). Where a partner's HIV status was determined it was almost universally because the partner had verbally disclosed their status. One third of events took part in the participant's home (33.8%), just under a quarter in their partner's home (23.8%), and fewer at "beats" (13.0%), saunas (14.7%), sex on premises venues (5.7%) or other sites (9.0%). In the minority of encounters the participant or their partner was affected by alcohol or drugs (31.1% and 27.0%).

Among the men, 61 (30%) reported no encounters involving anal sex, 70 (35%) reported at least one episode of UAI, and 114 (56%) reported at least one episode of PAI. Forty three men (21%) reported encounters involving UAI and encounters involving PAI. In the intercept only model, a joint test of the PAI variance and the UAI variance being equal to zero was significant ($\chi^2_2 = 47.63$, $0.001 > p$) (table 1).

This means that there existed statistically significant variation between men in their likelihood to report PAI rather than NAI and to report UAI rather than NAI.

The final model appears in table 2. Among the participant characteristics, age, education, country of birth, sexuality, work status, and income were not associated with PAI or UAI with $p < 0.10$. Significant predictors of PAI from NAI were the sexuality mix of the social network ($\chi^2_1 = 9.21$, $0.01 > p > 0.001$), the participant's relationship to the sexual partner ($\chi^2_2 = 10.03$, $0.01 > p > 0.001$), the partner's HIV status ($\chi^2_2 = 12.37$, $0.01 > p > 0.001$), where sex took place ($\chi^2_5 = 45.95$, $0.001 > p$), and whether the partner was affected by drugs or alcohol ($\chi^2_1 = 3.98$, $0.05 > p > 0.01$). Significant predictors of UAI from NAI were the participant's history of drug injection ($\chi^2_2 = 17.47$, $0.001 > p$), the participant's relationship to the sexual partner ($\chi^2_2 = 17.94$, $0.001 > p$), the partner's HIV status ($\chi^2_2 = 28.88$, $0.001 > p$), and where sex took place ($\chi^2_5 = 21.46$, $0.001 > p$). In the final model, the intercept variance for PAI was actually higher than in the intercept only model (2.00, 95% CI 1.23 to 2.78), whereas that for UAI was reduced by approximately one third (2.13, 95% CI 0.97 to 3.29). A joint test of the PAI variance and the UAI variance being equal to zero remained significant ($\chi^2_2 = 38.64$, $p < 0.001$)

PAI was more likely than NAI if the participant's social network was mostly homosexual, if the partner was an occasional or casual partner. PAI was less likely that NAI if the partner was HIV positive and if the encounter took place at a beat but more likely if it took place at a sauna. Finally, PAI was more likely than NAI if the partner was affected by drugs or alcohol. UAI was much more likely than NAI if the participant had injected drugs in the year before interview. It was less likely if the partner was occasional or casual. UAI was also less likely if the partner was HIV positive but more likely if the partner's HIV status was unknown or not determined. UAI was much more likely than NAI if the encounter took place at a sex on premises venue.

Of the 96 events of UAI, 11 (1.5% of all encounters) occurred between partners known or believed to be HIV serodiscordant.

DISCUSSION

This paper substantially advances our understanding of the complexity of homosexual and bisexual men's sexual practice. For the first time we have included in a single analysis the characteristics of individuals, their social networks, and their sexual encounters. Participant characteristics are not predictive of PAI over NAI and only the history of drug injection predicts UAI over NAI. Among social network characteristics, only whether or not the network contains a majority of homosexual men is predictive only of PAI versus NAI. In this analysis it is the characteristics of the sexual encounter that are the major predictors of whether PAI or UAI take place. It is the relationship between the partners, the partner's HIV status, and where the sex takes place that predicts whether PAI or UAI rather than NAI takes place. The predictors of PAI and UAI operate sometimes in the same direction and sometimes in opposite directions. Thus both PAI and UAI are less likely if the partner is HIV positive, but PAI is more likely if it is an occasional partner whereas UAI is less likely if it is an occasional partner.

Two particular implications flow from these findings. The first is that specific attention needs to be paid to the settings where sex takes place. The second is that a significant minority of men report both UAI and PAI. While the present study suggests that it is the characteristics and context of the encounter that determine whether UAI or PAI occurs, a more detailed understanding of what leads to men meeting partners with particular characteristics in particular settings is required. This represents a shift in thinking—from an understanding that a propensity to engage in UAI is an attribute of particular men, to a recognition that the occurrence of UAI (and PAI) is significantly shaped by characteristics and context of the specific sexual encounter.

The study has four limitations: the data are cross sectional; they are self reported; we do not know that this sample of men is representative of homosexual and bisexual men; and, we do not know whether this sample of sexual encounters is representative of all sexual encounters of the men in the study and other homosexual and bisexual men elsewhere. Thus, the sample comprised highly educated urban men the majority of whom were HIV negative and were not injecting drug users. It is possible that men of lower socioeconomic status, homosexually active men who did not identify as homosexual or bisexual, and injecting drug users are underrepresented. Another potential limitation of the study is that having only 733 sexual acts clustered within 202 men may not provide the statistical power desired.

ACKNOWLEDGEMENTS

Key messages

- A focus only on unprotected anal intercourse is too narrow. We need to understand more about where and why anal intercourse happens and the factors that lead to both protected and unprotected anal intercourse
- The characteristics and context of sexual encounters appear strongly associated with both protected and unprotected anal intercourse
- The settings in which sexual encounters take place appear to be important
- We need to know more about how men come to meet partners with particular characteristics in particular settings

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